

REMARKS

The Applicants thank the Examiner for his careful and thoughtful examination of the present application. By way of summary, Claims 1-10, 16-21, and 25-34 were pending and remain pending for consideration.

Response to Rejections Under 35 U.S.C. § 103

Claims 1-5, 7-9, 16-19, 21, and 27-29 are rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,615,854 to Hongo et al. in view of U.S. Patent Publication No. 2004/0038052 to Collins and further in view of U.S. Patent Publication No. 2001/0041447 to Nogami. The Applicants respectfully traverse the present rejections at least because Hongo, either alone or in combination with Collins and/or Nogami, fails to teach or suggest all of the features of the rejected claims.

As detailed below, the Applicants disagree with the factual assertion that Collins and Nogami show removal of an edge portion while a central portion is exposed – on the contrary, Collins explicitly covers the central portion while removing the edge portion, while Nogami does not show edge removal at all. The Examiner's statement that "Collins and Nogami clearly [teach] removing an edge portion of the seed layer while the central portion of the seed layer or the entire seed layer is exposed, since the removing the edge portion is performed before forming a conductive layer on the seed layer" is illogical. The fact that plating is performed on the central region *after* removal is irrelevant to the claimed seed layer exposure *while* removing the edge portion. Collins, for example, clearly covers the central portion during edge removal and subsequently uncovers the central portion for later plating, and thus cannot meet the claims.

Claims 1 and 16

The Applicants submit that Hongo, either alone or in combination with Collins and/or Nogami, does not teach or suggest all of the features of Claims 1 and 16. Claim 1 recites, *inter alia*:

removing an edge portion of the seed layer from the back edge surface and the bevel surface without removing the seed layer from a central portion of the front surface and front edge surface *while the central portion of the seed layer is exposed*; and

forming conductive material onto the seed layer coating the front edge surface and the front surface of the wafer after removing the edge portion of the seed layer from the back edge surface and the bevel surface.

Claim 16 recites, *inter alia*:

removing the seed layer from the back edge surface and the bevel surface while the entire seed layer is exposed; and
forming the layer by depositing the conductive material onto the seed layer coating the front edge surface and the front surface after removing the seed layer from the back edge surface and the bevel surface.

The Office Action acknowledges that Hongo merely discloses removal of the seed layer 83 from the back edge and bevel surfaces after forming the conductive material 85 and seems to acknowledge that the seed layer 83 is removed while the central portion of the seed layer 83 is covered by the plated layer 85, but attempts to make up for the deficiencies of Hongo by combination with Nogami and/or Collins.

The Office Action states that Collins teaches removing the seed layer 120 while the central portion of the seed layer 120 is exposed and wherein the entire seed layer 120 is exposed, citing Figures 2B and 2C. However, Collins recites:

The contact region 130 shown in FIG. 2C can be formed by depositing a layer of resist over the initial deposition of the second layer 120 shown in FIG. 2B (***resist not shown***). ***The layer of resist is then patterned and removed around the perimeter of the workpiece, and then the perimeter portion is etched away to expose the portion 132 of the first layer 110 shown in FIG. 2C.*** Suitable photo-patterning and etching processes are well known to those skilled in the art and not described here.

Collins at ¶ [0024] (all emphasis added). Thus, Collins explicitly teaches that the seed layer is ***removed while*** the central portion of the seed layer is ***covered with photoresist*** (i.e., not exposed). Indeed, a skilled artisan would appreciate that “suitable photo-patterning . . . processes” include the WEE and/or EBR processes discussed in the Amendment dated September 26, 2007, which are particularly suited to the intended purpose of Collins to create a contact region 130. Therefore, Hongo, alone or in combination with Collins, does not teach or suggest all of the features of Claims 1 and 16.

The Office Action states that Nogami teaches removing the seed layer 116 while the central portion of the seed layer 116 is exposed and wherein the entire seed layer 116 is exposed,

citing Figures 2B and 2C. The Applicant reiterates that the characterization of Nogami in the Office Action is inaccurate, and submits that Nogami does not teach or suggest that the seed layer 116 is formed on the bevel surface and the back edge surface. In fact, Nogami explicitly states that Figure 2B “depicts the system 100 after deposition of the seed layer 116.” Nogami at ¶ [0017]. Thus, Nogami does not even teach or suggest *removing* the seed layer 116 from the bevel surface and the back edge surface, let alone removing while a central portion or the entire seed layer 116 is exposed. The Office Action fails to point to a figure or a portion of the specification of Nogami that teaches either (1) deposition of the seed layer 116 on the bevel surface and back edge surface or (2) removal of the seed layer 116 from the bevel surface or the back edge surface. The Applicants submit that such deposition is not inherent, and note that the Office Action has not cited a reason that such deposition must *necessarily* occur. See M.P.E.P. § 2112(IV) (the fact that a certain result or characteristic may be present is not sufficient to establish the inherency of that characteristic (citing *In re Oelrich*, 666 F.2d 578, 581-82, 212 U.S.P.Q. 323, 326 (C.C.P.A. 1981))). To the contrary, a skilled artisan would appreciate that deposition methods for seed layers exist that do not deposit on the bevel surface and the back edge surface (e.g., using guard rings or the like to prevent such deposition). To the extent there is *any* disclosure regarding a seed layer on the edge and back in Nogami, the teaching is that it does not occur because the barrier layer 114 has been removed after the seed layer 116 has already been formed. See Nogami at ¶ [0020] (“because the portion of the barrier metal layer 114 at the edge and back of the substrate 112 has been removed, there is no seed layer for copper to adhere to at these portions of the substrate”). Thus, Nogami clearly does not teach or suggest that removal of an edge portion of the seed layer 116 is performed while a central portion or the entire seed layer 116 is exposed. Indeed, the only teaching corollary in Nogami is removal of the *barrier layer* 114 from the bevel surface and the back edge surface, but that is only accomplished when a central portion of the barrier layer 114 is covered with seed layer 116 (i.e., not exposed). Therefore, Hongo, alone or in combination with Nogami, does not teach or suggest all of the features of Claims 1 and 16.

Thus, no combination of Hongo, Nogami, and Collins, or any other references of record, teaches or suggests “removing an edge portion of the seed layer from the back edge surface and the bevel surface without removing the seed layer from a central portion of the front surface and

front edge surface *while* the central portion of the seed layer is exposed,” as recited by amended Claim 1 or “removing the seed layer from the back edge surface and the bevel surface *while* the entire seed layer is exposed,” as recited by amended Claim 16. Therefore, Hongo, either alone or in combination with Collins and/or Nogami, fails to teach or suggest all of the features of the amended claims.

Additionally, the combinations of features recited in amended Claims 1 and 16 can provide certain advantages that render the combinations non-obvious over the cited references, as explained in the Amendment dated September 26, 2007. Moreover, the Office Action still fails to provide an explicit analysis as to *why* one of skill in the art would combine the references in the manner recited by amended Claims 1 and 16, as required by *KSR Int’l Co. v. Teleflex, Inc.*, No. 04-1350 at 14, 550 U.S. ____ (Apr. 30, 2007). In particular, the Office Action is silent as to why a skilled artisan would leave a central portion of the seed layer or the entire seed layer exposed during removal of the seed layer from an edge portion.

The Office Action asserts that the Applicants are improperly arguing “against the references individually,” citing M.P.E.P. § 2145(IV) (which cites *In re Keller*, 642 F.2d 413, 208 U.S.P.Q. 871 (C.C.P.A. 1981) and *In re Merck & Co.*, 800 F.2d 1091, 231 U.S.P.Q. 375 (Fed. Cir. 1986) for the proposition that “One cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references.”). However, the Applicants note that the Office Action has failed to even make a *prima facie* case of obviousness by establishing that *any* of the references or a combination thereof would teach the features recited by Claims 1 and 16 (e.g., removal of the edge portion of the seed layer while the central portion of the seed layer is exposed or removing the seed layer from the back edge surface and the bevel surface while the entire seed layer is exposed). See M.P.E.P. § 2143.03.

The rejections appear to be based upon *factually incorrect* findings. The Applicants strongly disagree with the assertion that Hongo, Collins, and/or Nogami “clearly” teaches removing an edge portion of the seed layer while the central portion of the seed layer or then entire seed layer is exposed. To the contrary, Hongo and Collins explicitly and without reservation teach that removal of the edge portion of the seed layer is performed while the central portion of the seed layer is *covered* by a conductive layer or photoresist, and Nogami fails to teach or suggest removal of the edge portion of a seed layer at all. Assuming, *arguendo*, that the

Office Action had demonstrated that the elements of the claims were known in the prior art, something more is required. See *KSR* at 14-15; see also M.P.E.P. § 2145(I), ¶ 3 (“When considering obviousness of a combination of *known elements* . . .”) (emphasis added). Only after a *prima facie* case has been established does the burden shift to the Applicants to come forward with arguments and/or evidence to rebut the *prima facie* case. See M.P.E.P. § 2142, ¶ 1 & M.P.E.P. § 2145, ¶1 (citing *In re Dillon*, 919 F.2d 688, 692, U.S.P.Q.2d 1897, 1901 (Fed. Cir. 1990)). Thus, while the Applicants are arguing that none of the references teaches or suggests the elements of the claims, the Applicants argue that, *a fortiori*, a combination of those references also does not teach or suggest the elements of the claims.

The Applicants respectfully submit that Claims 1 and 16 are patentable as not obvious over the cited combinations. Therefore, the Applicants respectfully request that the Examiner withdraw the rejections of the Claims 1 and 16.

Claims 2-10, 17-19, 21, and 27-29

As described above, amended Claims 1 and 16 are patentable over Hongo, alone or in combination with Collins and/or Nogami. Claims 2-10 and 27-29 depend from Claim 1. Thus, Claims 2-10 and 27-29 include all of the features of Claim 1 and recite unique combinations of additional features not taught or suggested by the cited references. Claims 17-19 and 21 depend from Claim 16. Thus, Claims 17-19 and 21 include all of the features of Claim 16 and recite unique combinations of additional features not taught or suggested by the cited references. Therefore, the Applicants respectfully request that the Examiner withdraw the rejections of Claims 2-10, 17-19, 21, and 27-29.

Claims 6, 10, 20, and 30-34

Claims 6, 10, 20, and 30-34 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Hongo in view of Collins and further in view of Nogami, and further in view of U.S. Patent No. 6,352,623 to Volodarsky et al. The Applicants respectfully traverse the present rejections because Hongo, either alone or in combination with Collins, Nogami, and/or Volodarsky, fails to teach or suggest all of the features of the rejected claims.

As described above, Claims 1 and 16 are patentable over Hongo, alone or in combination with Collins and/or Nogami. Claims 6, 10, and 30-34 depend from Claim 1. Thus, Claims 6, 10,

Appl. No. : 10/782,697
Filed : February 18, 2004

and 30-34 include all of the features of Claim 1 and recites unique combinations of additional features not taught or suggested by the cited references. Claim 20 depends from Claim 16. Thus, Claim 20 includes all of the features of Claim 16 and recites a unique combination of additional features not taught or suggested by the cited references. Volodarsky does not make up for the deficiencies of Hongo, Collins, and Nogami. For example, Volodarsky at least does not teach or suggest removing an edge portion of the seed layer from the back edge surface and the bevel surface while the central portion of the seed layer is exposed or removing the seed layer from the back edge surface and the bevel surface while the entire seed layer is exposed. Moreover, the Applicants respectfully disagree with the characterization of Volodarsky, which does not teach a method of removing selected portions of a conductive layer (e.g., the back edge surface and the bevel surface) using electrochemical etching. Therefore, the Applicants respectfully request that the Examiner withdraw the rejections of Claims 6, 10, 20, and 30-34.

Claims 25 and 26

Claims 25 and 26 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Hongo in view of Collins and further in view of Nogami, and further in view of U.S. Patent No. 5,897,379 to Ulrich et al. The Applicants respectfully traverse the present rejections because Hongo, either alone or in combination with Collins, Nogami, and/or Ulrich, fails to teach or suggest all of the features of the rejected claims.

As described above, amended Claims 1 and 16 are patentable over Hongo, alone or in combination with Collins and/or Nogami. Claim 25 depends from Claim 1. Thus, Claim 25 includes all of the features of Claim 1 and recites a unique combination of additional features not taught or suggested by the cited references. Claim 26 depends from Claim 16. Thus, Claim 26 includes all of the features of Claim 16 and recites a unique combination of additional features not taught or suggested by the cited references. Ulrich does not make up for the deficiencies of Hongo, Collins, and Nogami. For example, Ulrich does not teach or suggest removing an edge portion of the seed layer from the back edge surface and the bevel surface while the central portion of the seed layer is exposed or removing the seed layer from the back edge surface and the bevel surface while the entire seed layer is exposed. Therefore, the Applicants respectfully request that the Examiner withdraw the rejections of Claims 25 and 26.

Appl. No. : 10/782,697
Filed : February 18, 2004

No Disclaimers or Disavowals

Although the present communication may include alterations to the application or claims, or characterizations of claim scope or referenced art, the Applicants are not conceding in this application that previously pending claims are not patentable over the cited references. Rather, any alterations or characterizations are being made to facilitate expeditious prosecution of the present application. The Applicants reserve the right to pursue at a later date any previously pending or other broader or narrower claims that capture any subject matter supported by the present disclosure, including subject matter found to be specifically disclaimed herein or by any prior prosecution. Accordingly, reviewers of this or any parent, child, or related prosecution history shall not reasonably infer that the Applicants have made any disclaimers or disavowals of any subject matter supported by the present application.

Co-Pending Application of Assignee

The Applicants wish to draw the Examiner's attention to the following co-pending application of the present application's assignee: U.S. Patent App. Serial No. 10/676,895, filed September 30, 2003, entitled "EDGE AND BEVEL CLEANING PROCESS AND SYSTEM."

Summary

The Applicants respectfully submit that all of the pending claims are allowable. The Applicants respectfully request that the Examiner withdraw the rejections and pass Claims 1-10, 16-21, and 25-34 to allowance.

Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410.

Respectfully submitted,

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Dated: 3/6/08

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